Remarks

Reconsideration is requested in view of the preceding amendments and the following remarks. By this Amendment, claims 16, 17, and 29 are amended. Claim 15 is canceled without prejudice. New claims 30-51 are presented for consideration. Upon entry of this Amendment, claims 6, 16-17 and 29-51 are in the application.

New claims

Applicants present new claims 30-51 for consideration. New claim 30 is supported, for example, by original claim 18. New claims 31, 36, 45, and 48 are supported, for example, by original claim 22 and by FIGS. 1-2. New claims 32-33 are supported, for example, by original claims 19-20. New claim 34 is supported, for example, by original claim 5. New claim 35 is supported, for example, by original claim 6. New claim 37 is supported, for example, in the Specification at page 15, line 17, to page 16, line 15. New claims 41 and claim 47 are supported, for example, in the Specification at page 11, line 4, to page 13, line 21. New claims 42 and 49-50 are supported, for example, in the Specification at page 15, lines 6-16. New claims 38, 40 and 51 are supported, for example, in the Specification at page 17, lines 9-18, and FIGS. 1-3. New claim 43 is supported, for example, in the Specification at page 9, lines 12-26. New claim 44 is supported by claim 17, for example. New claim 46 is supported, for example, by original claims 8 and 15. No new matter is presented.

The § 103(a) rejection of claims 16 and 17 should be withdrawn

Claim 16 stands rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent Application Publication No. 2004/0114939 to Taylor ("Taylor") in view of U.S. Patent No. 6,456,380 to Naganuma ("Naganuma"). This rejection is traversed.

As amended, claim 16 recites an optical sampling system, comprising:

> a data input to receive a test signal;
> a sampling pulse input to receive a sampling pulse;
> an optical system configured to produce a first combination of the test signal and the sampling pulse having a first relative phase difference between the sampling pulse and the test signal, and to produce a second combination of the test signal and the sampling pulse;

> a retardation plate configured to receive the second combination and to modify a relative phase difference between the sampling pulse and the test signal so that the second combination has a second relative phase difference, wherein the second relative phase difference is different from the first relative phase difference;
>
> a first balanced detector and a second balanced detector configured to receive the first combination having the first relative phase difference and the second combination having the second relative phase difference, respectively, and produce a first balanced signal and a second balanced signal, respectively; and
>
> a signal processing system configured to combine the first balanced signal and the second balanced signal.

The combination of Taylor and Naganuma does not describe at least "a retardation plate configured to receive the second combination and to modify a relative phase difference between the sampling pulse and the test signal so that the second combination has a second relative phase difference, wherein the second relative phase difference is different from the first relative phase difference" as recited in amended claim 16. Amendments to claim 16 are supported, for example, by FIGS. 1-2 of the Specification.

The Examiner agrees that Taylor "fails to specifically disclose a retardation plate." (Office action at page 4.) The Examiner further states that "Naganuma discloses a retardation plate," and "it would have been obvious to a person of ordinary skill in the art at the same time the invention was made to modify Taylor's invention as to use a retardation wave plate in one of the local oscillator light signal paths." (Office action at pages 4-5.) However, such a use as described by the Examiner does not describe a "retardation plate configured to receive the second combination" as recited in claim 16. Therefore, the combination of Taylor and Naganuma does not teach the recited retardation plate.

For example, FIG. 3A of Taylor clearly illustrates that a phase shift is imposed on the local oscillator signal before being combined with the incoming signal. Taylor states that the "90° hybrid passive unit splits both the signal and LO and then combines in each output arm a replica of the signal with a replica of the LO. However, there is an extra path length in one arm of the LO splitter to apply the phase shift." (Taylor, ¶ 50.) (Emphasis added). Merely modifying Taylor's system by using a retardation wave plate in one of the local oscillator light signal paths instead of using an extra path length, as suggested by the Examiner, does not teach the recited retardation plate which is "configured to receive the second combination and to modify a relative

phase difference between the sampling pulse and the test signal so that the second combination has a second relative phase difference."

Furthermore, because Taylor teaches applying a phase shift before the local oscillator signal is combined with the incoming signal, Taylor in fact *teaches away* from "a retardation plate configured to receive the second combination and to modify a relative phase difference between the sampling pulse and the test signal so that the second combination has a second relative phase difference, wherein the second relative phase difference is different from the first relative phase difference" as recited in claim 16.

Accordingly, because the combination of Taylor and Naganuma does not teach or suggest all the features of claim 16, the Examiner's 35 U.S.C. § 103 rejection of claim 16 should be withdrawn. Claims 17 and 30-35 depend from claim 16 and are therefore allowable for at least the reasons recited above with respect to claim 16. Therefore, the Examiner's rejection of claim 17 should be withdrawn.

The § 112(a) rejection of claim 29 should be withdrawn

Claims 6 and 29 stand rejected under 35 U.S.C. § 112(a) as being indefinite. Applicants have amended claim 29 as suggested by the Examiner. Therefore, the Examiner's rejection of claim 29 and dependent claim 6 should be withdrawn.

New claims 39-46 are allowable over Taylor and Naganuma

New claim 39 recites an optical sampling system, comprising:

> a sampling source producing a sampling signal comprised of sampling pulses that repeat at a repetition rate;
>
> an input for receiving a data signal comprised of data pulses;
>
> an optical system configured to receive the sampling signal and the data signal, to produce a first combination of the signals having a first relative phase difference between the sampling pulses and the data pulses, and to produce a second combination of the signals having a second relative phase difference between the sampling pulses and the data pulses, wherein the second relative phase difference is different from the first relative phase difference;
>
> a first balanced detector and a second balanced detector configured to receive the first combination and the second combination, respectively, and to produce a first balanced signal and a second balanced signal, respectively; and

a signal processing system configured to combine the first balanced signal and the second balanced signal to produce a linear optical sampling signal.

The combination of Taylor and Naganuma does not teach or suggest at least "a sampling source producing a sampling signal comprised of sampling pulses that repeat at a repetition rate."

For example, Taylor describes a local oscillator source as being "narrow linewidth lasers, such as external cavity semiconductor lasers." (Taylor, ¶ 25.) Taylor also states that "a DFB laser can be used for the LO and the signal lasers." (Taylor, ¶ 26.) However, narrow linewidth lasers and DFB lasers are not sources "producing a sampling signal comprised of sampling pulses that repeat at a repetition rate." As understood by Applicants, the local oscillator of Taylor is not a pulsed source but a narrow band, continuous wave source.

Naganuma does not cure Taylor of its deficiencies. As understood by Applicants, Naganuma does not describe "a sampling source producing a sampling signal comprised of sampling pulses that repeat at a repetition rate."

Accordingly, claim 39 is allowable over the combination of Taylor and Naganuma. Claims 40-46 depend from claim 39 are also allowable over the combination for at least the reasons recited above with respect to claim 39.

New claims 47-51 are allowable over Taylor and Naganuma

New claim 47 recites an optical sampling method, comprising:

receiving an optical data signal and a train of optical sampling pulses, wherein the optical sampling pulses are temporally offset relative to optical data pulses of the optical data signal by a plurality of delay times;

directing first portions of the optical data pulses and the optical sampling pulses with a first relative phase difference to a first balanced detector to obtain corresponding in-phase balanced signal;

directing second portions of the optical data pulses and the optical sampling pulses with a second relative phase difference to a second balanced detector to obtain corresponding quadrature balanced signal; and

combining the in-phase balanced signal and the quadrature balanced signal to obtain corresponding linear optical sampling signal that is a function of the plurality of delay times.

The combination of Taylor and Naganuma does not teach or suggest at least "receiving an optical data signal and a train of optical sampling pulses, wherein the optical sampling pulses are

temporally offset relative to optical data pulses of the optical data signal by a plurality of delay times . . . and combining the in-phase balanced signal and the quadrature balanced signal to obtain corresponding linear optical sampling signal that is a function of the plurality of delay times."

As an example, the Specification describes at page 11, lines 4-10, the variable τ as "a relative delay between the data pulse and the sampling pulse." Furthermore, the Specification describes "a linear optical sampling signal" that is a function of the delay (e.g., the linear optical sampling signal is represented as $S(\tau)$). (Specification at page 13, lines 10-18.)

By contrast, Taylor states that "the electric field of the local oscillator may be described as: $\mathrm{Re}\left[E_{LO}e^{i\omega_{LO}t}\right]$ where E_{LO} is a constant for a local oscillator." (Taylor, ¶ 15-17.) Throughout Taylor, E_{LO} is written as a constant without time dependence. Therefore Taylor does not describe "optical sampling pulses [that] are temporally offset relative to optical data pulses of the optical data signal by a plurality of delay times." Furthermore, the signal obtained by Taylor (e.g., see Eq. 6 of Taylor) is not a function of a delay time but is instead a function of real time, t.

Naganuma does not cure Taylor of its deficiencies. Naganuma describes an "optical signal to be measured." (Naganuma at FIG. 1.) However, Naganuma does not describe "receiving an optical data signal and a train of optical sampling pulses, wherein the optical sampling pulses are temporally offset relative to optical data pulses of the optical data signal by a plurality of delay times . . . and combining the in-phase balanced signal and the quadrature balanced signal to obtain corresponding linear optical sampling signal that is a function of the plurality of delay times."

Accordingly, claim 47 is allowable over the combination of Taylor and Naganuma. Claims 48-51 depend from claim 47 are also allowable over the combination for at least the reasons recited above with respect to claim 47.

Conclusion

In view of the preceding amendments and remarks, Applicants respectfully submit that all pending claims are properly allowable and that the application is in condition for allowance. If any issues remain, the Examiner is requested to telephone the undersigned.

Respectfully submitted,

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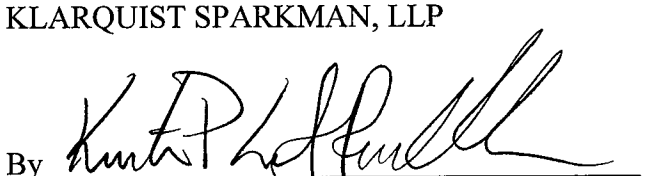
By 
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